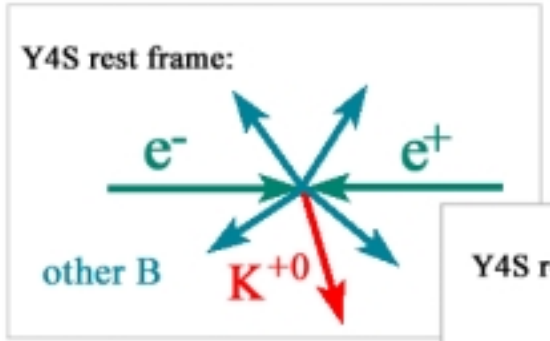
Signal and Backgrounds

Signal:

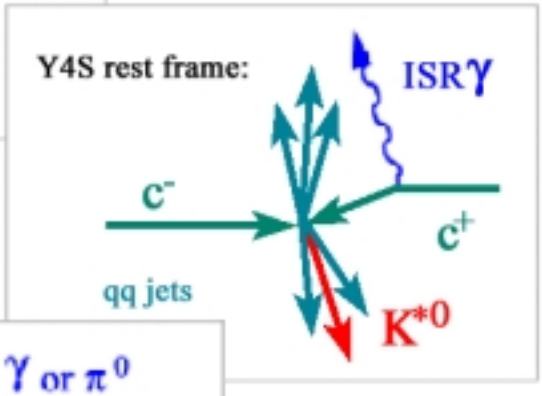
$B^0 \rightarrow K^{*0}\gamma,\ K^{*0} \rightarrow K^+\pi^-$

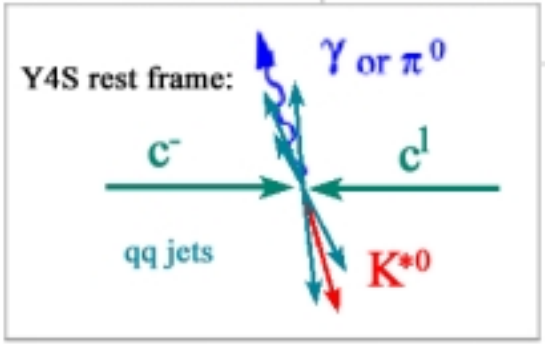


Backgrounds:

50% ISR $e^+e^- \rightarrow q\bar{q}\,\gamma$

50% $e^+e^- \rightarrow q\bar{q} \rightarrow X\,\pi^0$





π^0 Rejection in Photon Selection

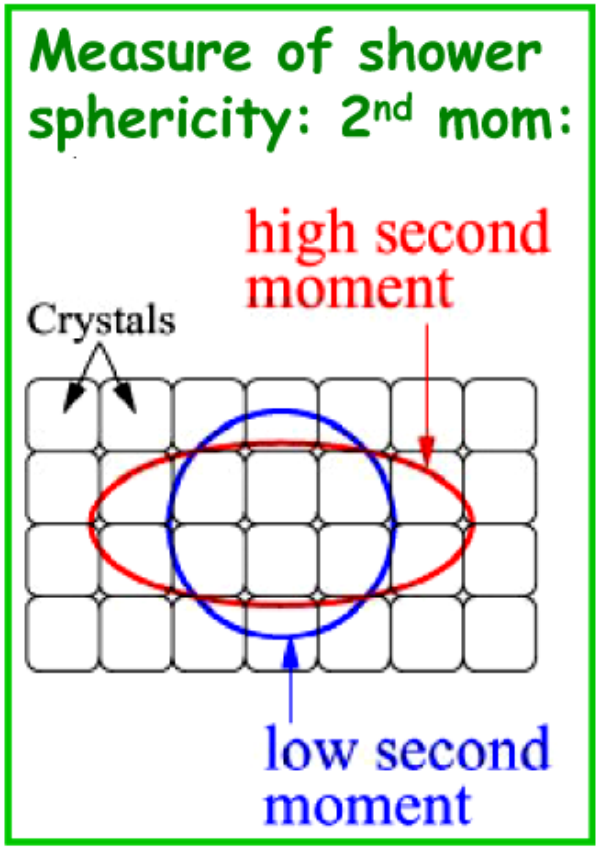
Means for π^0-γ separation:

- Only accept cluster in calorimeter with one local maximum
- Cluster Second Moment <0.002 →
- Veto γ from π^0 and η

→ π^0 rejection 97%

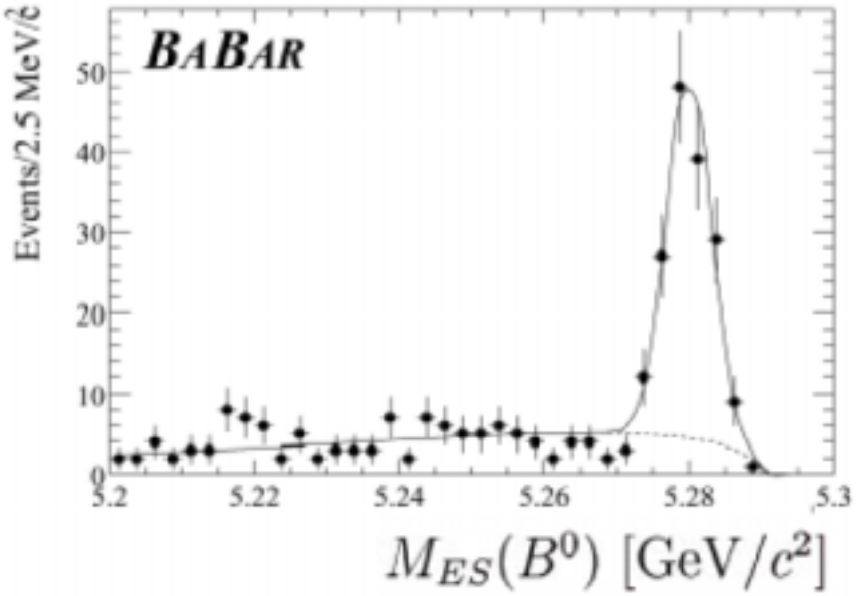
→ Efficiency 83%

→ Total photon efficiency 53%



Signal Estimation

M_{ES} -Distribution for data and -200 MeV$< \Delta E^* <$100 MeV :



Unbinned maximum Likelihood fit of M_{ES}-distribution :

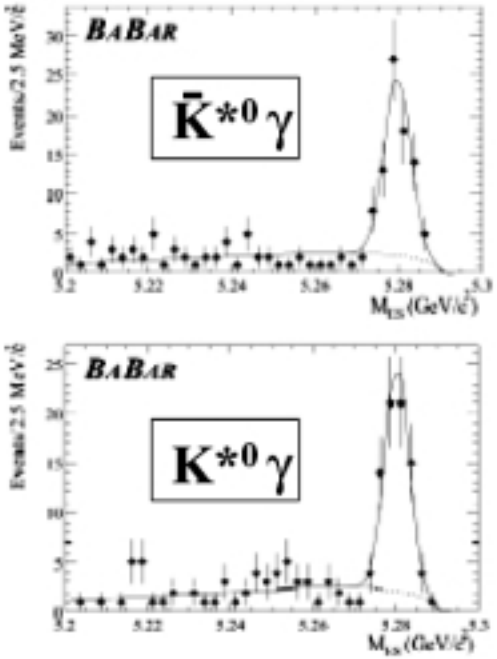
- "ARGUS" function for background (shape determined from off-resonance data)
- Gaussian for signal
- Fit with fixed background shape and floating signal mean, signal width and signal fraction

Yield: $N_{signal} = 139.2 \pm 13.1$ events

$\rightarrow \mathcal{B}(B^0 \rightarrow K^{*0}\gamma) = (4.39 \pm 0.41) \times 10^{-5}$

Measurement of *CP* Asymmetry

M_{ES} – Distribution for B^0 and $\bar{B}^0$:



Extraction of asymmetry:

- Separate fits of M_{ES}-distributions of charged conjugate B^0s
- Separate fits of off-resonance data → no background asymmetry
- Charge asymmetry of particle identification is negligible

Yields: $N(B^0) = 72.1 \pm 9.4$ events

$N(\bar{B}^0) = 67.2 \pm 9.1$ events

→ $A_{CP} = -0.035 \pm 0.094$

Preliminary Results

Decay fraction:

BABAR **(22.7×10^6 B$\bar{\text{B}}$):** $\mathcal{B}(B^0 \to K^{*0}\gamma) = (4.39 \pm 0.41(\text{stat}) \pm 0.27(\text{sys})) \times 10^{-5}$

PDG (CLEO:9.7 x 10^6 B$\bar{\text{B}}$): $\mathcal{B}(B^0 \to K^{*0}\gamma) = (4.55 \pm 0.70(\text{stat}) \pm 0.34(\text{sys})) \times 10^{-5}$

SM Expectation: $\mathcal{B}(B^0 \to K^{*0}\gamma) = (3.3 - 6.3) \times 10^{-5}$

CP asymmetry:

BABAR **(22.7×10^6 B$\bar{\text{B}}$):** $A_{CP} = -0.035 \pm 0.094(\text{stat}) \pm 0.022(\text{sys})$

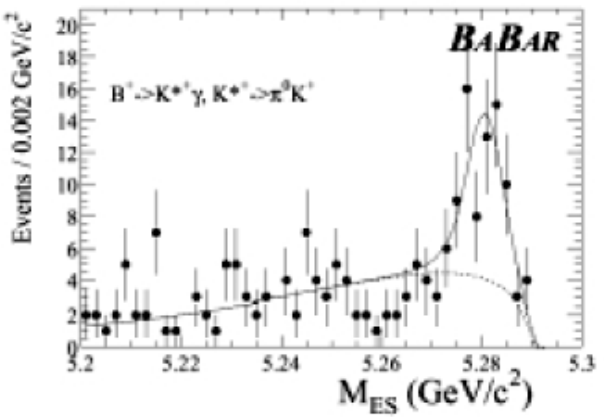
PDG (CLEO:9.7 x 10^6 B$\bar{\text{B}}$): $A_{CP} = 0.08 \pm 0.13\ (\text{stat}) \pm 0.003(\text{sys})$

SM Expectation: $A_{CP} < 1\%$

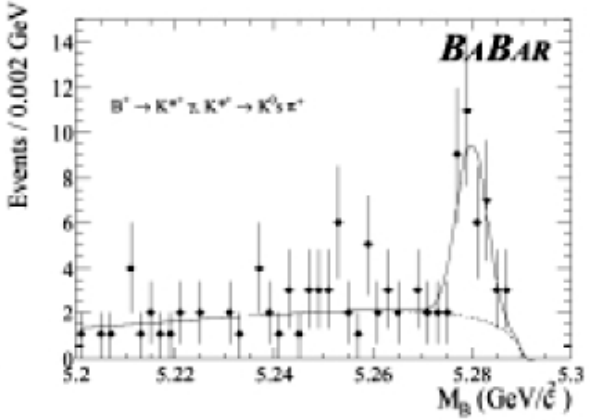
Additional Modes of B → K*γ

Signals observed in further K^* decay modes:

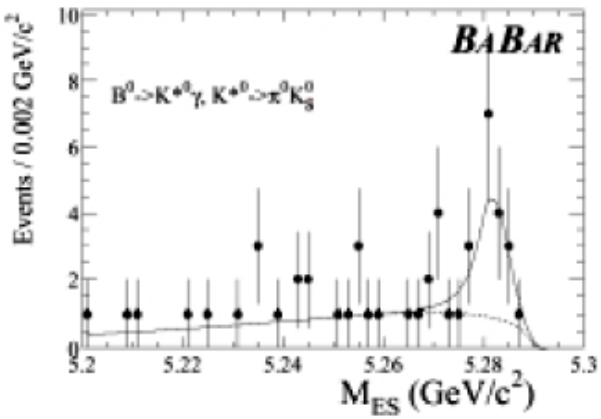
$K^{*+} \rightarrow K^+\pi^0$:



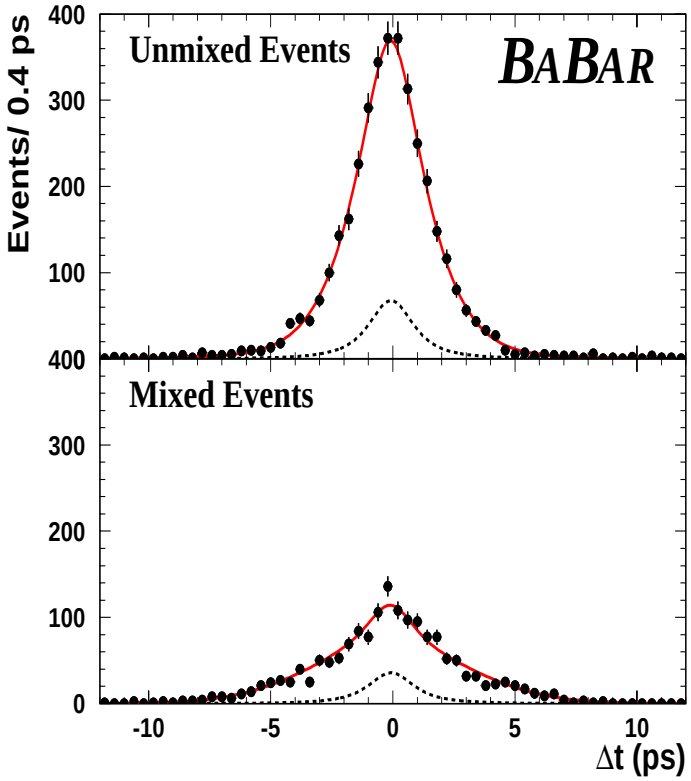
$K^{*+} \rightarrow K_S\pi^+$:

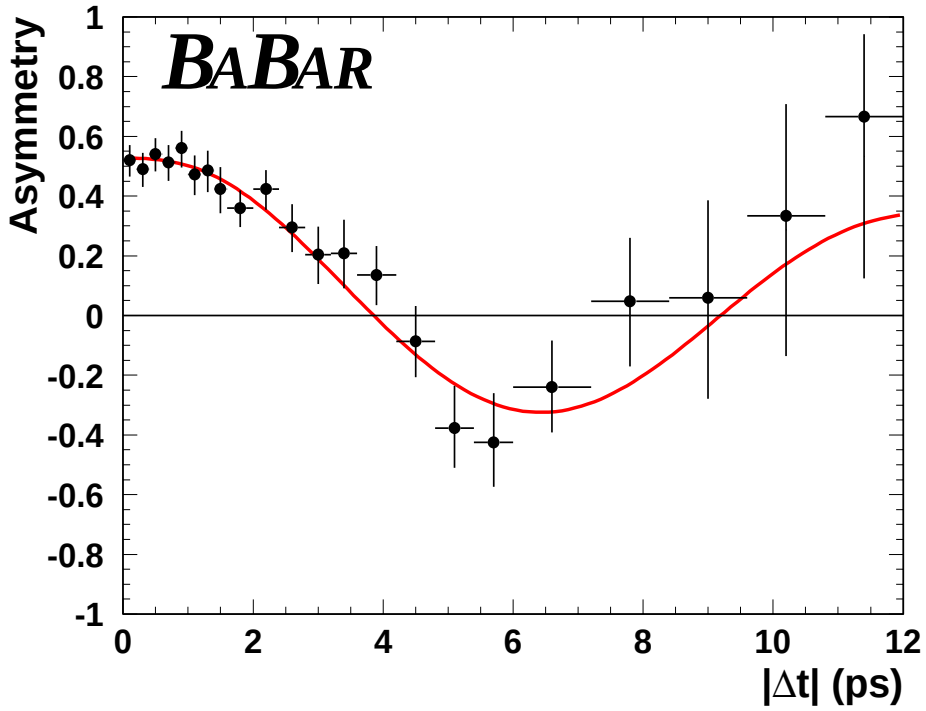


$K^{*0} \rightarrow K_S\pi^0$:



Δt distributions and oscillations for tagged hadronic B decays

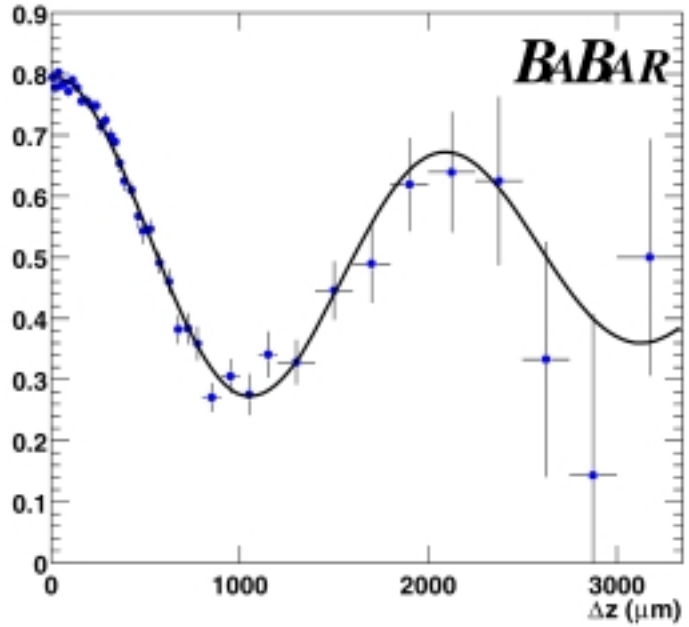


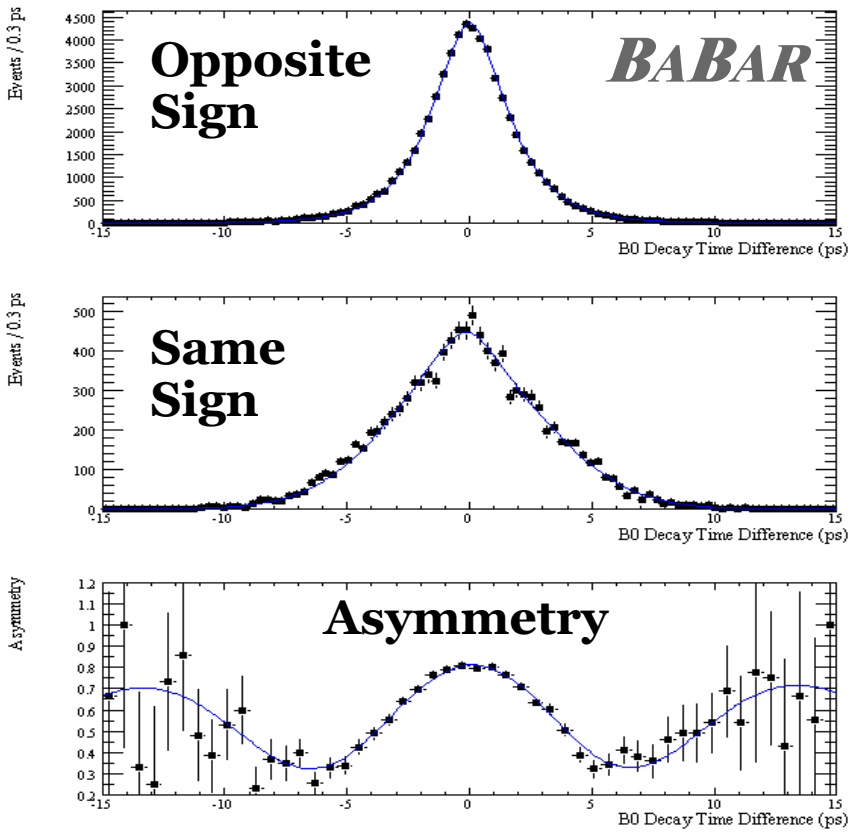


Signal + bkgnd Background

$\Delta m_{B0} = 0.519 \pm 0.020 \pm 0.016$ ħ ps^{-1}

Mixing with Dilepton Sample



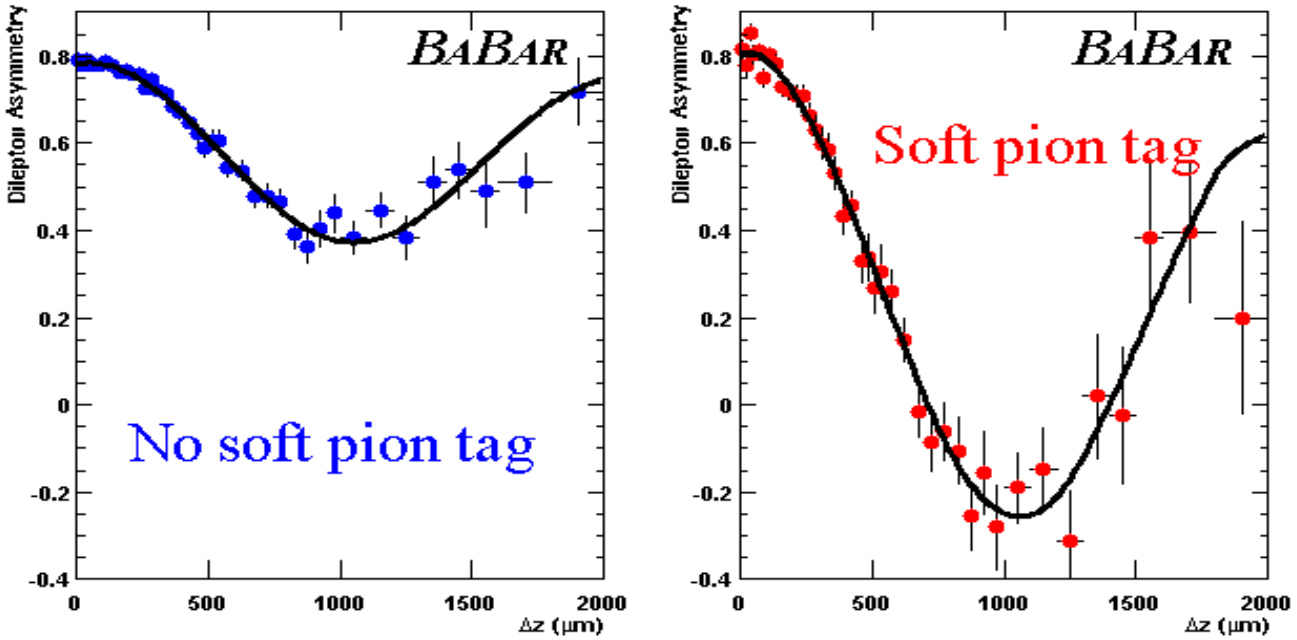


Run 99-00 Preliminary Result

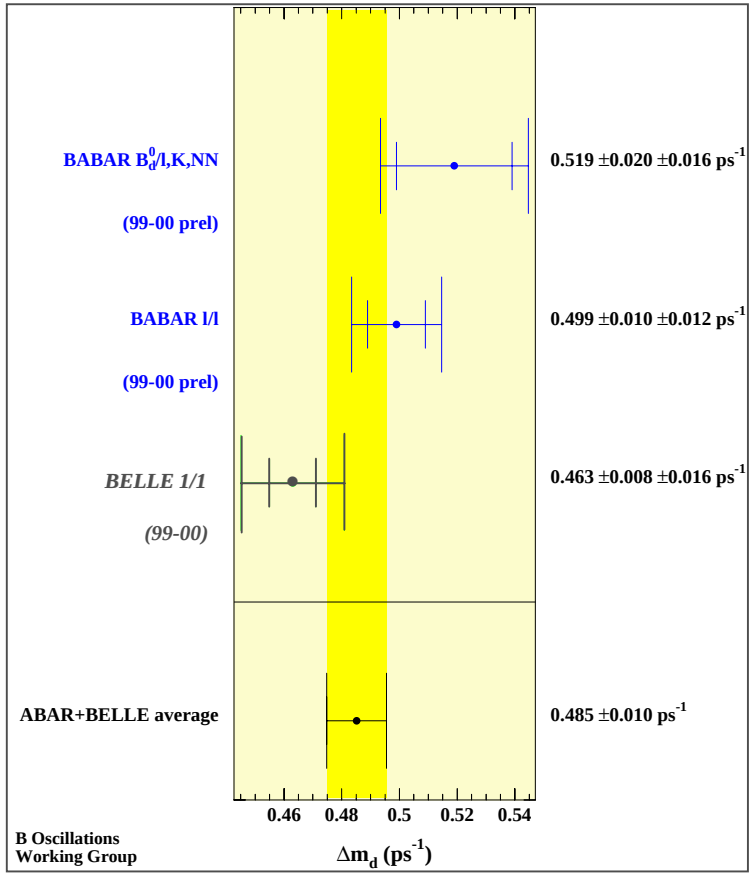
$$\Delta m_d = (0.499 \pm 0.010\,(\text{stat}) \pm 0.012\,(\text{syst}))\,\text{ps}^{-1}$$

$$\text{error from PDG} \approx 0.018\,\text{ps}^{-1}\,(\text{stat} + \text{syst})$$

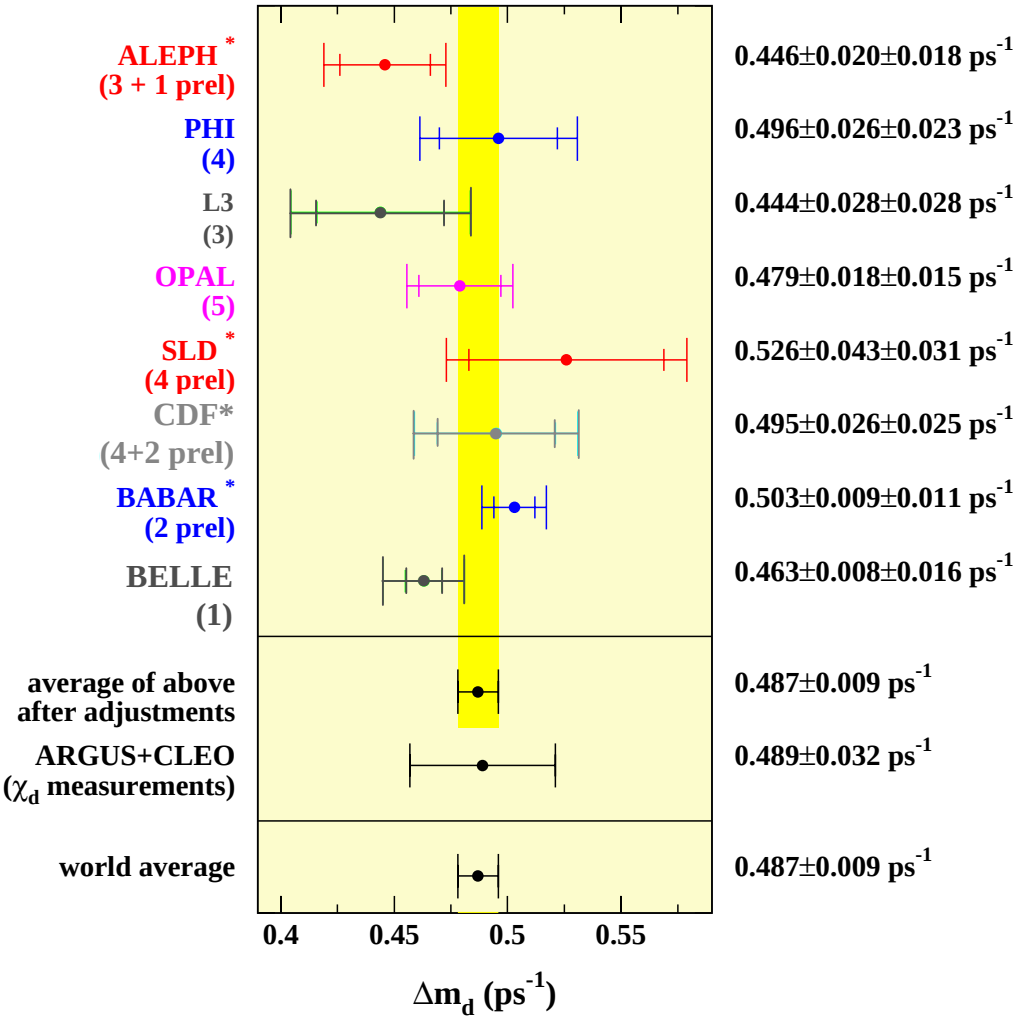
Mixing with Dilepton Sample: Use of Soft Pions



Mixing Results



B-Factories



World Average

BABAR Results Winter/Spring 2001

✻ Published
✜ Updated Preliminary
☆ Preliminary
◆ To be released soon

✻ *CP*-violation in charmonium (sin2β)
✜ Exclusive charmonium branching fractions
✜ Inclusive charmonium branching fraction
☆ J/ψ production in the continuum
☆ J/ψ K* angular analysis
☆ J/ψ K versus J/ψ π
◆ Search for Direct-CP violation in J/ψ K^+
☆ Branching fractions for D_s(*) D(*) modes
☆ Branching fractions for D*D* modes
☆ Branching fractions for D(*) D(*)K modes
✜ Charmless two-body modes:
ππ, πK, KK, $\pi\pi^0$, πKs, π^0Ks, KsKs
☆ Charmless modes with φ (+ K, Ks or K*)

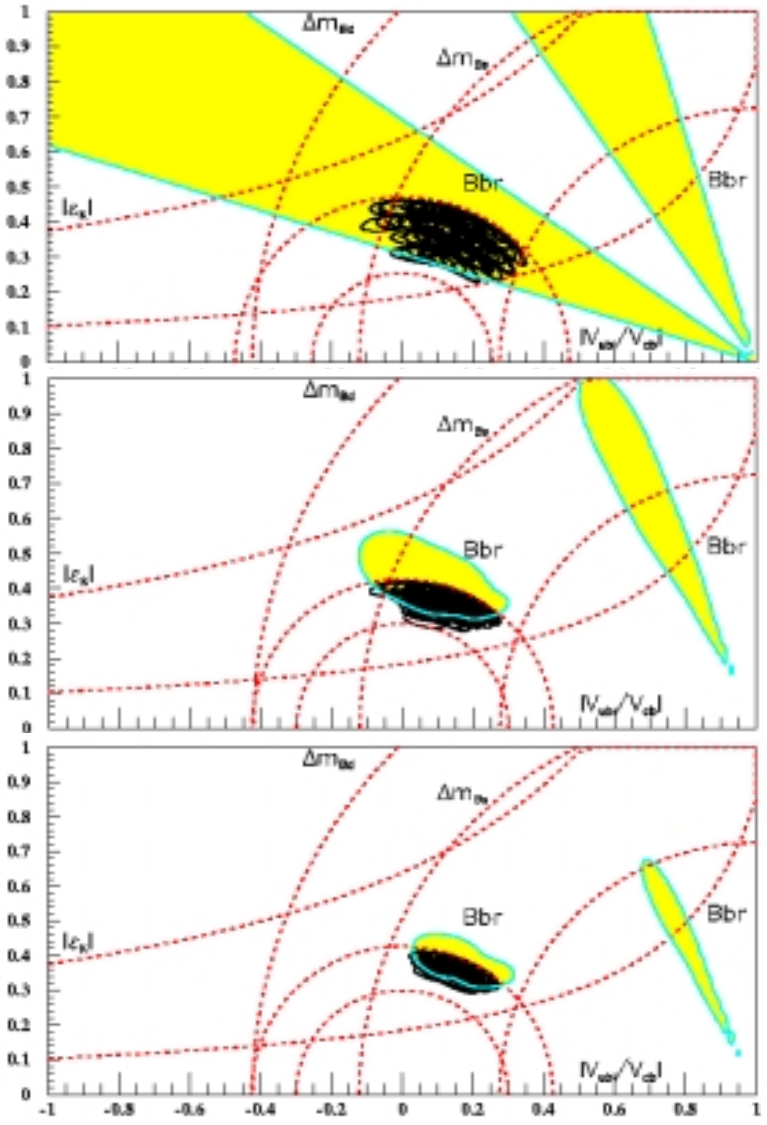
◆ Charmless modes with ω
◆ Charmless modes with η and η′
◆ Charmless 3-prong modes
◆ Inclusive φ, η
✜ Mixing with dilepton sample
◆ Lifetimes with dilepton sample
✜ Mixing with hadronic sample
✜ Lifetime with hadronic sample
◆ Mixing with D*lν sample
◆ Lifetime with D*lν sample
✜ $B \rightarrow K^* \gamma$
☆ $b \rightarrow s \gamma$
☆ $B \rightarrow \gamma\gamma$ (limit)

and more ….

PEP-II Luminosity Upgrade Timeline

PEP-II Luminosity Upgrade Timeline				J. Seeman	for the PEP-	II Staff		10/9/00
Item	Upgrade	Luminosity increase factor	Target luminosity xE33/cm2/s	Activity start date	Hardware ready date	Probable luminosity date	Max LER Current (A)	Max HER Current (A)
1	Starting luminosity	1.00	2.64	Oct-00	Oct-00	Oct-00	1.45	0.65
	Near term projects:							
2	Lower betay* (12.5 mm to 9 mm)	1.30	3.43	Oct-00	Jul-00	Mar-00	1.45	0.65
3	Raise beam-beam tune shifts to 0.05	1.10	3.78	Oct-00	Sep-00	Mar-01	1.60	0.72
4	Raise the number of bunches to 800	1.20	4.53	Oct-00	Oct-00	May-01	1.92	0.86
5	Third LER RF station (bunches=1024)	1.28	5.80	Oct-99	Feb-01	Aug-01	2.46	1.10
	Medium term projects:							
6	Raise beam-beam tune shifts to 0.06	1.15	6.67	Feb-01	Feb-01	Jul-02	2.80	1.10
7	Sixth HER Station (bunches=1125)	1.14	7.60	Oct-00	Nov-02	Dec-02	2.80	1.30
8	Fourth LER RF Station (bunches=1658)	1.30	9.88	Oct-00	Nov-02	Dec-03	3.70	1.30
	Long term projects:							
9	Lower beta y* to 5 mm (new IR?)	1.56	15.42	Oct-02	Oct-04	Feb-05	3.70	1.30
10	Raise beam-beam tune shifts to 0.07	1.17	18.04	Oct-02	Oct-04	Apr-05	3.70	1.30
11	Seventh HER RF station	1.15	20.74	Oct-02	Oct-04	Jun-05	3.70	1.50
12	Reduce HER bunch length from 9 to 6 mm	1.11	23.03	Oct-02	Oct-04	Jul-05	3.70	1.50
13	Fifth LER RF station	1.07	24.64	Oct-02	Oct-04	Oct-05	4.00	1.50
14	Improve LER longitudinal feedback	1.14	28.09	Oct-02	Oct-04	Dec-05	4.60	1.50

BABAR Unitarity Triangle Sensitivity



30 fb $^{-1}$

sin2β

90 fb $^{-1}$

sin2β, sin2α

180 fb $^{-1}$

sin2β, sin2α

Conclusions

SLAC has a broad and exciting HEP Scientific Program

- ***B*** **Factory beginning to produce its first publications. Results from 20 fb^{-1} already fall into the "best of" category. Lots more to come by this summer**
- **GLAST is moving ahead well. Received high marks at its recent Lehman Review**
- **Möller Scattering experiment commences running this Spring**
- **Accelerator R&D making excellent progress on all fronts. New phenomena — plasma less focusing of e^+ as an example — are seen**